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COMPLETE SPECIFICATION.

Improvements in and relating to Divided Crank-axles.

I, GOMER PHILLIP JONES, of 29, Mattoon Street, in the City of Springfield, County of Hampden, and State of Massachusetts, United States of America, Mechanical Engineer, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained, in and by the following statement;—

This invention relates to divided crank-axles for use in bicycles or other constructions, and has for its object the production of means for uniting the ends of said crank-axle between the cranks whereby the union thereof is greatly simplified, strengthened, and cheapened; a further object being the provision of means whereby any looseness of the two parts of the axle, due to use or wear, will be automatically taken up. The invention consists in the construction as described and claimed in the accompanying specification and shown in the drawings.

Referring to the drawings accompanying this specification,—

Figure 1 shows a side elevation of the divided crank-axle as applied to a bicycle crank-hanger, some of the parts being shown in section.

Figure 2 is a view of the central part of the axle taken at right angles to the positions thereof shown in Figure 1.

Figure 3 is a cross section taken on line 3—3, Figure 1.

Figure 4 is an end view of Figure 1 showing the driving sprocket-wheel and the relation of the crank thereto.

Figure 5 is a section through one of the cranks on line 5—5, Figure 1.

Figure 6 is an elevation, partly in section, of a two-part crank-axle showing means for automatically taking up any looseness of fit between the axle-parts.

Figure 7 is an end view of Figure 6, with certain parts removed.

In the drawings, A represents the crank-hanger of a bicycle frame having in each end thereof the ball-cups 2, 2. The cranks B, B^1, are each made integral with part of the axle C, which is round; and substantially one-half of the axle forms part of each of said cranks B, B^1, and is located at right angles thereto.

The ends of the axle are beveled off in a plane parallel with the line of said cranks, the degree of inclination to the axis of the axle of said beveled ends being such that the extremities of the axle, when said beveled ends are applied to one another, as shown in Figures 1 and 2, at 3, will lap to the extent of about two-thirds of the length of the axle between the cranks.

On that part of the axle forming part of the left-hand crank B^1, and on that part thereof contiguous to the crank is cut a left-hand screw-thread 4.

An annular projection 5, is located on the axle part forming part of the crank B, at any convenient point, in the length of that portion of the axle which is beveled,

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but preferably near the end of said axle, and projects at right angles to the axis thereof.

A sleeve 6 is provided for the reception of the axle parts C, C, of the cranks B B¹, the interior diameter of which slightly exceeds the diameter of the said axle. Obviously, the said axle-parts C, C, cannot fit closely in said sleeve or it would not be possible to enter that part of the axle having the lug 5 thereon, in the recess or groove 15 in said sleeve. Said parts C, C, are of a somewhat smaller diameter than the interior of the sleeve, as shown in Figure 3, though the difference in the diameters of the said parts is somewhat exaggerated in this Figure, for the sake of clearness. On one end of said sleeve, at right angles thereto, and preferably integral therewith, is the circular flange 7 to which the sprocket-wheel 8 is secured by screws 9, as shown, or in any other suitable manner.

A cone 10 is turned up on the inside face of said flange 7, where it joins the sleeve 6, on which cone the balls in the cups 2, bear. The cone 12 for the opposite end of the bearing, is screwed onto the end of the sleeve 6, as shown, and a suitable check-nut 13, locks said cone in any desired position. Said cones 10 and 12, are flanged, as shown in Figure 1, in the usual manner for overlapping the end of the crank-hanger A, to exclude the dust therefrom. These flanges are represented by 14, 14. Obviously, the cone 10 may be made separate from the sleeve 6, if desired, and secured thereon in any convenient manner. The inner end of said sleeve 6, opposite the flange 7, is threaded to correspond with the screw-thread 4, cut on the axle forming part of the crank B¹.

In the interior surface of the sleeve 6, at a point which would lie opposite the projection 5, when the two beveled ends of the axle are supplied to each other in proper position within said sleeve, (as shown in Figures 1 and 2), is formed the annular groove 15 of substantially the same width and somewhat deeper than the height of said projection above the surface of the axle. When the end of the axle C, on the crank B, is entered in said sleeve 6, this part of the axle being less than a cylinder, may be swung a little to one side so that the projection 5 may be brought in line with groove 15 in the sleeve, when this part of the axle may be swung so that the projection 5 engages with said groove 15, and when the opposite crank-axle B¹ is entered into the said sleeve, and rotated to screw it into engagement therewith the crank B is rotated by the engagement of the beveled ends of both axle parts, but the said axle portion while it has a free rotary motion in the sleeve at that time, is prevented from any endwise motion therein by the engagement of projection 5, with the groove 15. The extension of the beveled portion of the threaded axle C past the portion with the projection 5 therein, forces the projection 5 into the groove 15 and retains it there.

The engagement of the said projection 5, on the axle C, with the groove 15 in the sleeve 6, when the crank B¹ and the portion of the axle C, forming part thereof, has been screwed into the sleeve 6, locks the sleeve securely to the axle part. Both axles continue rotating together in the sleeve 6, and the beveled end of the axle part on the crank B¹, slides along the beveled face of the opposite axle part until both axle parts are forced tightly against the walls of the inclosing sleeve 6, by reason of the contact of these beveled ends and the forced approach of the cranks one to the other, by the screwing of the one in one end of the sleeve 6, and the retention of the other of said cranks in the sleeve by the engagement of the said projection 5 thereon with the groove 15.

The thread 4 on the left-hand crank-axle being a left-hand thread, force applied thereto to drive the machine forward would tighten the connection between the axle parts and the sleeve 6, were not the latter secured together to rotate as one, as hereinafter described. And likewise, a back-pedaling motion would tend to unscrew the crank B¹, but the right-hand crank B, is secured to the sprocket-wheel 8, preferably as shown in Figures 1, 4, and 5, though any manner of connection which will attach the crank B to the sleeve so that they will rotate together, may be employed.

The manner of making the connection of the crank, either with the sprocket or sleeve, these parts being practically one piece) is illustrated in two different ways in the drawings.

The first method, shown in Figures 1 and 4, is in the nature of a permanent fastening of one with the other in that when that fastening is completed the parts are immovable, one relative to the other, and said parts are secured together as follows:—

On the crank B, is a boss 16 (either integral therewith or attached thereto) which boss engages with suitable radially disposed notches or slots 17, cut in the sprocket-wheel.

A slot 18, concentric with the axle, divides said notches 17, and a screw 19, passing through said slot and engaging with the boss 16, serves to lock the crank B in engagement with any one of the said notches.

In case it should become necessary to screw up the crank B^1, into firmer engagement with the sleeve 6, the screw 19 is removed and the sprocket wheel also removed from the flange 7, and the crank B^1, is then screwed up to a firmer engagement with the sleeve 6, care being taken to secure the proper alinement of the boss 16, with one of the notches 17, of the sprocket-wheel, with which said boss engages.

The sprocket-wheel is then replaced and by means of the screw 19 the sprocket and the crank B, are secured to each other.

The second method of securing the crank-axle to the sleeve or sprocket consists in a device which permits the rotation of the axle, relative to the sleeve, only in a direction necessary to effect a tighter screwing up of said axle in said sleeve, and will not permit the rotary movement of said axle in said sleeve in a contrary direction, whereby any looseness of the one of said parts, relative to the other, will be automatically taken up while the machine is in use, the weight of the rider serving, through the sprocket and chain connections, to hold said sleeve against rotation, and the foot pressure applied to the cranks supplying the force necessary to screw the crank-axle into said sleeve more firmly.

This connection is illustrated in Figures 6 and 7, and is constructed as follows:—

A ratchet-wheel 20 is formed on or secured, preferably to the part of the crank-axle C, on the crank B, and a pawl 21 is pivotally supported in the plane of said ratchet and normally pressed into engagement with the teeth thereof by a suitable spring 22.

It is obvious that the position of these parts,—that is the ratchet and pawl,—may be reversed and the pawl supported on the crank-axle part, and the ratchet formed on or secured to the end of the sleeve 6 or part within which the axle-ends are united for rotation as one piece, and such mere reversal of parts would fall within the scope of this invention.

That end of the sleeve 6 in which the part B of the crank-axle C enters differs slightly in construction (see Figures 6 and 7) from that shown in the other figures of the drawings, *viz.*, 1 and 4,—whereby it is adapted to receive the said ratchet and pawl.

In the flange 7 suitable pins 23 are inserted which register with holes in the web of the sprocket-wheel 8 whereby the latter and said sleeve may rotate as one piece when said sprocket is in position on said sleeve. An exteriorly screw-threaded hub 24 is formed on the outer surface of the end of said sleeve on which the sprocket is located, which hub is provided with an annular cavity 25 to receive the ratchet-wheel 20 on the crank-axle, the said hub projecting sufficiently beyond the face of said sprocket-wheel, when in its proper position on the sleeve, to receive a nut 26 screwed onto the threaded part of said hub and serving the double purpose of holding said sprocket securely against the face of said flange 7, and of confining said pawl within a cavity 27 formed by cutting an aperture through the web of the sprocket-wheel, one side of which aperture is closed by the face of

the flange 7 and the other side by the face of the nut 26 screwed onto the said hub on the end of the sleeve.

A part 28, of the aperture cut through the flange of the sprocket, is of circular form, as shown in Figures 2 and 7, to receive the end 29 of said pawl 21, and the boundary 30 of said aperture lying opposite the part 28 thereof has the form of the arc of a circle struck from the center of said part 28. Thus the pawl is confined in a cavity, the borders of which permit only swinging movements in the plane of the ratchet-wheel, and obviates the necessity of a pin in the face of the flange 7, for said pawl to swing on, the spring 22 restraining said pawl against movements other than those described. If desired, however, said pawl may be hung on a pin.

On the upper edge of said pawl 21, and preferably integral therewith, is the arm 31, the free end of which is threaded to receive a nut 32 which bears on two lips 33 formed in the borders of the extreme upper part of the aperture in said sprocket. By moving said nut 32 out towards the end of said arm, the pawl will be moved into engagement with the teeth of the ratchet-wheel 20 and be held in such engagement by the spring 22. By screwing said nut onto said arm, in the opposite direction, the pawl may be drawn out of engagement with the teeth of the ratchet-wheel by the bearing of the end of said nut on said lips 33, and when the pawl is so drawn out of engagement, the spring 22 will be compressed and will, upon the reverse action of the nut, force said pawl again into position to engage the teeth of the latter.

When said pawl is disengaged from said ratchet, the axial parts can be turned within the sleeve 6, in a direction to cause the crank B^1, and its attached axle part to be unscrewed from said sleeve, whereby both parts of the crank-axle may be removed therefrom, said sleeve remaining in the crank-hanger of the bicycle.

It is obvious that if one of the crank-axle parts is prevented from rotating independently of the sleeve, that no disengagement of either of the cranks from said sleeve is possible.

The construction herein described is exceedingly strong and simple and inexpensive, no check-nuts being required to lock the parts, and the adjustment of the ball-bearing devices being in no wise altered by the removal of the crank-axle parts or their replacement.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A two-part crank-axle, each part consisting of a crank and an integral shaft section, the two shaft sections having overlapping bevels, one of said sections having a projection on its outer surface of such part of the beveled shaft section as forms less than a semi-cylinder, combined with a sleeve having a recess into which said projection extends, the overlapping bevels holding the projection on the one shaft section into the recess in the sleeve, substantially as described.

2. A two-part crank-axle each part consisting essentially of a crank and a shaft section, the two shaft sections having beveled proximate faces and together forming a substantially cylindrical shaft, one of said sections having an external projection from its outer cylindrical surface at a point where the diameter of the section below the projection is less than half a cylinder, a sleeve with a recess therein to inclose the divided axle and receive the projection thereon, and means for securing one of the axle sections to the sleeve to prevent independent rotation, all combined substantially as described.

3. The combination in a divided crank-axle comprising two axle and crank-sections, and a tubular member within which said axle-sections are united by a screw-engagement of one of them with said member, of a ratchet and pawl devices located between said axle and said member, whereby said axle is rotatable in said member in one direction only, substantially as described.

4. In a divided crank-axle comprising two axle-sections each having a crank thereon, of a sleeve whereby said axle-parts are united by the screw-threaded engagement thereof with said sleeve, and means for preventing the unscrewing of said axle-parts and said sleeve, consisting of a ratchet on one of said parts and a pawl on said sleeve for engaging said ratchet, substantially as described.

Dated this 26th day of January 1899.

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Sheet 1

Fig. 2.

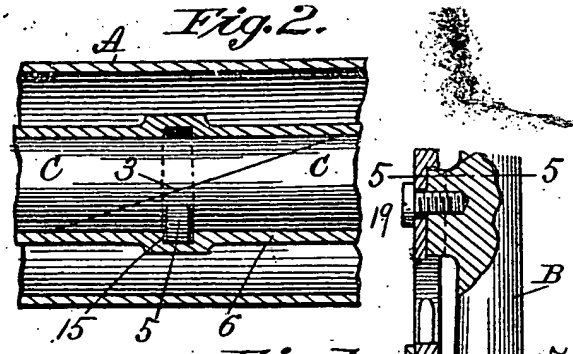
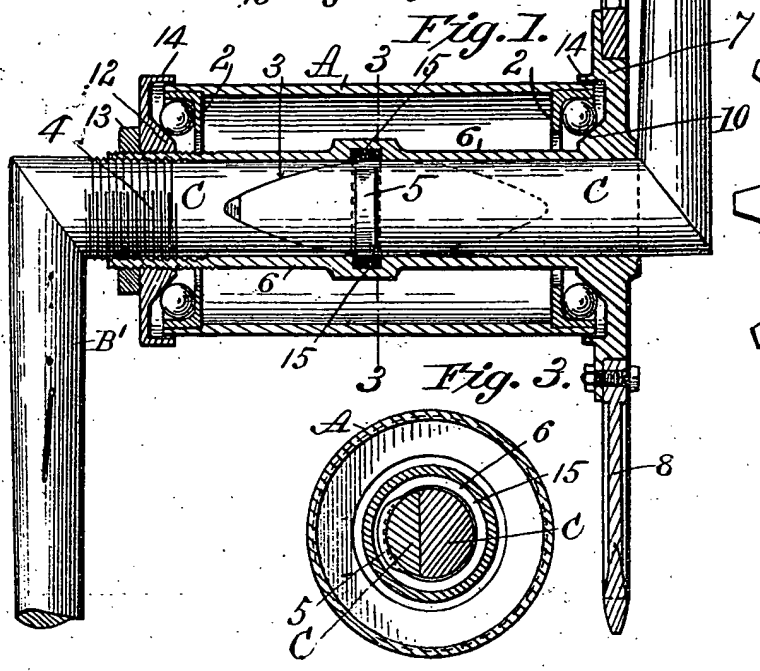


Fig. 1.



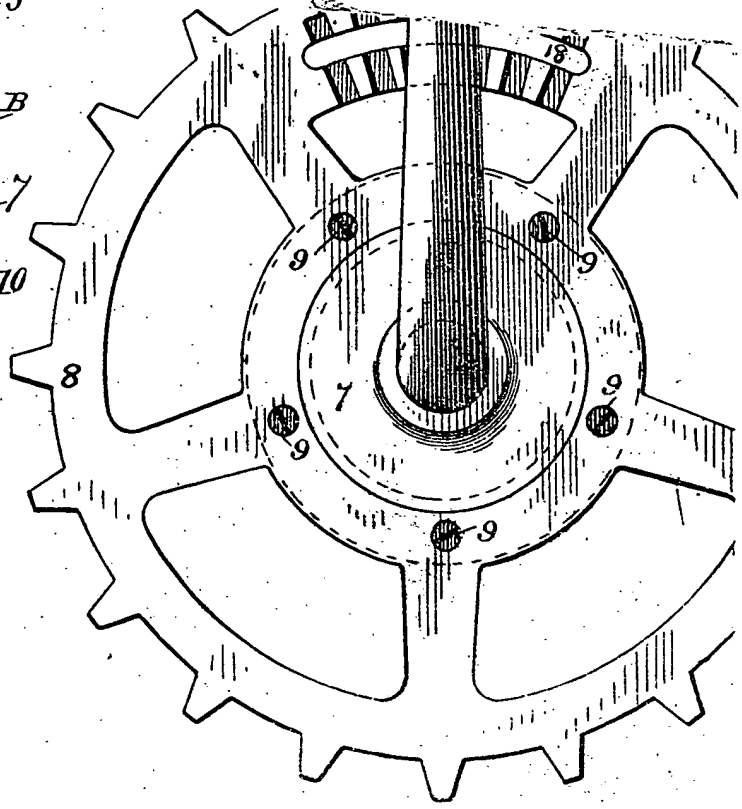


Fig. 3.

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Fig. 6.

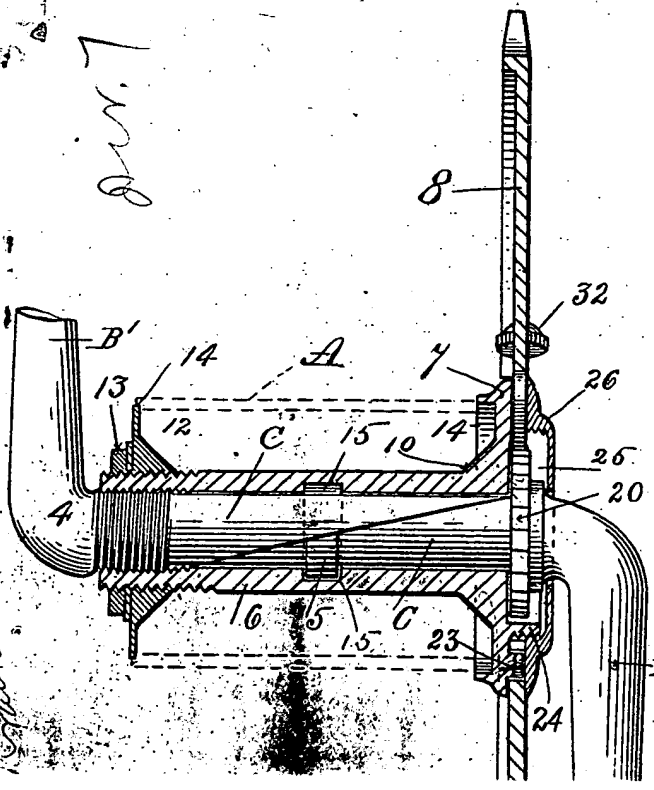

Fig. 7.